

*Artesian Well in Lowest Trias at Norristown.**Notes by Prof. O. C. S. Carter.**(Read before the American Philosophical Society, May 1, 1891.)*

Drilled in the Trias of Norristown, near Stony creek, for water for steam boilers.

15'	Made ground.....	to	15'
23	Sandstone, light colored, coarse grained, containing fragments of orthoclase feldspar.....		38
33	Sandstone, dull red, fine grained, with specks of muscovite. Color due to iron oxide.....		71
31	Sandstone, light pink (produced by pink orthoclase), fine grained; quartz grains transparent; fine specks of muscovite mica.....		102

Water was struck every ten feet down to 70; none thence to 90; abundance of water between 70 and 102 (located by the driller at 95, 100 and 102); cased at 18 with 6 inch pipe ($5\frac{1}{2}$ inside). Steam pump furnished 1003 gallons per hour. After pumping 4000 gallons, the level of water in well fell 12 feet; after 7500 gallons, it fell 16 feet and stood.

Analysis of well water gave 11.8 degrees of hardness, as compared with 6 degrees for Schuylkill river water; 14 degrees for English surface New Red water (Wanklyn); and 17 degrees for English deep well, New Red water.

The lime exists mostly as carbonate, with some sulphate, and probably comes from the cement between the sandstone grains.

Another artesian well, situated within a hundred feet of this one, gave water which precipitated in the boilers a fine white powder of carbonate of lime, which did not cake and was easily blown out. This well water is therefore as useful in steam boilers as is Schuylkill river water; and is better, because it holds no mud or sand in suspension. A little soda neutralizes the sulphate of lime. The water also becomes perceptibly softer after continued pumping.

Artesian Well in Lowest Trias, at Norristown.

Well drilled about half a mile from the Trenton limestone, which outcrops at Moge's Station, on the Schuylkill river, to obtain water for the manufacture of artificial ice.

Cased at 28 feet with 6 inch pipe.

30'	Sandstone, very white and fine grained, containing a little pink orthoclase.....	to	30'
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5'	Sandstone, white, containing coarse fragments of orthoclase.	35'
6	Shale, dark red	41
14	Sandstone, white, containing muscovite mica.	55
10	Sandstone, lighter color, more feldspathic.	65
3	Sandstone, very white, fine grained.	68
6	Sandstone, dark red, coarse, containing much iron oxide and a little mica.	74
4	Shale red	78
18	Sandstone, red, fine, micaceous.	96
4	Shale red.	100

Water was first struck between 35 and 40. More than ten "crevices" [probably water cracks] passed between 35 and 100. The water now rises to within 16 feet of surface. Steam pump delivers 1500 gallons per hour. After ten hours' pumping the water falls only 10 feet in well, the whole fall occurring, however, in the first 45 minutes. With an improved pump 3000 gallons per hour were obtained.

Water Well in Lowest Trias, at Washington Square, Montgomery County.

22'	Sandstone, red, micaceous. to	22'
12	Clay, stiff, red.	34
1	Shale, red (<i>Trias</i>).	35

Water first struck at 16 feet; a crevice every 3 or 4 feet; stands at 11 feet from the surface, and never falls lower, no matter how much is pumped, at the rate of 1500 gallons per hour.

Artesian Well in Trias, in Worcester Township, Montgomery County, Pa.

Drilled on the Duffield farm, on the north bank of Stony creek, at the crossing of the Stony Creek Railroad, between Custer and Belfry, through New Red (*Trias*) red shale and clay slates, some of them blackened with coaly matter.

20'	Clay slate, gray, hard; little mica. to	20'
5	Clay slate, <i>blackened</i> with coaly matter.	25
5	Shale, red.	30
5	Clay slate, dark, fine grained.	35
5	Clay slate, very <i>black</i> , hard, compact.	40
3	Shale, red.	43
2	" <i>Quartzite</i> ".	45
3	Clay slate, gray.	48
17	Clay slate, compact, hard.	65

The *quartzite* was said by the driller to be so hard that he could only drill six inches of it in ten hours.

Water was first struck at 38 ; again at 65 ; nowhere else. Water stands at 15 feet of the surface ; yields 60 gallons per hour ; drops 25 feet after pumping 6 hours.

Evidently the Stony creek water soaks slowly through the bed planes between the clay slates.

Artesian Well in Lower Silurian Limestone, in Montgomery County, Pa.

Drilled on Charles Kunkle's farm, south side of the Valley Green road, east of the Bethlehem pike, north-northeast of Flourtown.

40' Limestone, not micaceous.	to	40'
20 Limestone, micaceous.....		60

Water first struck at 40' ; depth of well 60' ; several small "crevices ;" water stood at 35 feet beneath the surface, and was not lowered by steam pumping 500 gallons per hour.

Artesian Well in Lower Silurian Limestone, at Parkesburg, Pa.

By Prof. J. P. Lesley.

Mr. P. H. Gibbons, Vice-President of the Parkesburg Iron Co., at Parkesburg, Chester county, Pa., was good enough to furnish me by letters dated January 1, February 9 and February 11, 1886, with fragmentary notes of the boring, and forty-five samples for examination, which I have in bottles, the depth in feet recorded on the corks, and finely powdered specimens on glass slides for microscopic use.

Soil, first passed through.....	18'
Limestone struck.....	at 20
Quicksand encountered.....	at 23
Cased quicksand out.	at 24
Limestone ("bastard"), more dense and solid.	to 42
Quicksand again.....	at 42
Limestone.....	to 53
Quicksand, with flow of water.....	at 53
Limestone, purer.....	to 92
Sandstone, yellow, fine grained, 7' thick.....	to 99
Limestone, of varying qualities, sometimes sandy, "then mica, then lime or marble ;" no water.	to 174
Limestone, of varying nature.....	to 522

Specimens examined under the lens, at the following depths :

- 27' Resembles a sandstone, light gray, with white fracture, some quartz crystals and a show of mica.
- 32 Same as above, with a trace of iron oxide.

- 34' Same as above, with an increase of mica.
37 Same as above.
43 Same material, but blackish gray.
60 More carbonate of lime, and some mica ; reddish crystals, peroxide of iron.
69 Large percentage of carbonate of lime.
79 Limestone.
90 Limestone.
95 Quicksand, yellowish white.
99 Same as last.
102 Limestone ; mica and quartz in quantity.
117 Limestone, reddish.
122 Limestone, bluish light gray, mica.
150 Limestone, with yellowish red crystals.
171 Limestone, white, fine grained.
179 Same as last.
194 Same as last.
208 Limestone, grayish white.
227 Same as last.
239 Same as last.
255 Same as last.
268 Same as last.
282 Same as last.
288 Limestone, hard, and fine grained, light gray, white.
302 Same, increasing in hardness.
308 Same as last.
324 Same, gray and white ; show of mica.
332 Same, darker gray ; more mica.
347 Same as last.
360 Same, bluish gray ; coarse granules.
372 Same as last.
387 Same as last.
404 Same, granules finer ; show of mica.
415 Same, grayish white, still finer ; less mica.
422 Same as last.
433 Same, dark gray, mica, iron.
448 Same, more crystalline (rhombohedral) ; more mica.
455 Same, crystalline, dark gray.
464 Same, crystalline, gray and white.
472 Same, fine crystals, light gray.
486 Same, finer granules, very hard ; with mica.
502 Same, perfectly crystalline ; more mica and feldspar.

One slide prepared to show crystalline forms.

The occasional dissemination of minute flakes of mica and fine grains of feldspar through the limestone is better evidence of the deep-sea

deposition of these Ordovician or Lower Silurian limestone beds than is the silica in quartz form which they contain.

The beds are highly tilted to the south; therefore the vertical hole exaggerates the thickness. The formation is probably "Calceiferous" No. *Ila*, but no fossils have been found just here. No record of water obtained.

Artesian Well in Potsdam Sandstone, in Montgomery County, Pa.

Notes by O. C. S. Carter.

Drilled on William Janeas' property, near Williams Station, at the crossroads, south of Lancasterville, and east of Spring Mill, the Plymouth Railroad sweeping around it on the southwest.

64'	Sandstone (<i>Potsdam No. I</i>), coarse	to 64'
6	Sandstone, fawn colored, micaceous.....	70
10	Sandstone, light brown, fine.....	80
10	Sandstone, coarse, micaceous, transparent quartz.	90
22	Sandstone, fine, micaceous.....	112
6	Sandstone, very coarse, larger fragments of quartz, with red iron stains.	118
4	Sandstone, coarse	122
4	Sandstone, fine, grayish brown.....	126
4	Sandstone, coarse, fawn colored.	130
2	Sandstone, fine, resembling ground ginger.	132

No conglomerate like that of the Willow Grove Potsdam outcrop passed through; beds tightly laid so that water crevices were few and insignificant. No water struck until the drill reached 80. Water rose and stood at 70. Steam pump delivered only 300 gallons per hour; water falling 10 feet after pumping 10 hours.

Artesian Well of Chalybeate Water, in Chester Valley Clays, near King of Prussia, Montgomery County, Pa

Notes (condensed) of Prof. Oscar C. S. Carter.

Drilled on William Thomas' land; 90 feet deep; water, deep brown (cider) color, even after 30,000 gallons had been drawn by a steam pump in three days; bubbles of carbonic acid gas constantly escaping; water not clear after standing several days; precipitate, analyzed, was carbonate of iron; precipitation not complete after a week.

35'	Yellow clay.....	to 35'
10	Layer of rounded pebbles of white quartz, resembling those on the sea shore.....	45

10'	Fine white sand and pebbles.....	55'
10	Blue clay, holding iron balls.....	65
10	Fine yellow clay, holding iron balls.....	75
	Thin bed of solid sandstone which seemed to be <i>Triassic</i> , perhaps not <i>in situ</i> .	
5 feet	of Chester Valley limestone (no more limestone)	80
	Struck top of <i>Potsdam S.S.</i>	at 90

Water first struck at about 40' down ; at first, muddy ; soon cleared on standing ; supply soon exhausted by the pump ; merely surface water.

No more water until depth of 81'.

Chalybeate water at 81' ; immediately rose in the dry well to within 32' of surface. Pumped this water, 60,000 gallons, during 5 days (steam pump). Then iron water exhausted, and clear water took its place. Iron water evidently came from clay beds holding iron balls ; some of which were brought up by the drill. Well cased (6" iron pipe) to 83'.

Water stratum evidently lies between the clays and the rock floor.

Artesian Well in the Mica Schist of Philadelphia.

Notes by O. C. S. Carter.

Drilled by H. W. Kelsey, of the Oriental Bath Co., 1104 Walnut street, Philadelphia, for the supply of the baths.

Drillings at every 10 feet examined under a lens ; elements arranged below in order of their abundance in the specimen pumping. No rock seen except mica schist and gneiss. Only *traces* of feldspar noticed above 170. Colorless muscovite mica makes all the strata nearly white from 160 to 210. The biotite mica darkens the strata from 210 to 266. *No hornblende seen in any of the pumpings.*

20'	Clay, the Philadelphia brick clay.....to	20'
46	Gravel (thin layer of clay at bottom).....	66
34	Mica schist ; milky quartz, biotite mica, occasional speck of muscovite mica, no feldspar.....	100
20	Mica schist ; muscovite mica and trans. quartz.....	120
10	Mica schist ; biotite, quartz and muscovite.....	130
10	Mica schist ; quartz, muscovite, some little biotite....	140
10	Mica schist ; biotite, quartz, some little muscovite....	150
10	Mica schist ; coarse fragments of quartz and muscovite.	160
10	Gneiss ; coarse fragments of pink orthoclase, muscovite and quartz ; <i>first appearance of feldspar</i>	170
10	Gneiss ; quartz, orthoclase feldspar and muscovite....	180
10	Gneiss ; muscovite, quartz, biotite, little feldspar....	190
10	Gneiss ; muscovite, orthoclase and quartz.....	200
10	Gneiss ; muscovite, orthoclase and transparent quartz	210

10' Mica schist; quartz, biotite, muscovite	220'
10 Mica schist; biotite, quartz, muscovite	230
20 Mica schist; biotite and quartz.....	250
15 Mica schist; biotite, muscovite, quartz.....	265

Few crevices; strata tightly packed; first rock water struck at 120; rose to 28' beneath surface; pumped 5 quarts a stroke, 80 strokes a minute, 6000 gallons an hour; level falls 20' after one hour's pumping.

Water a little hardened by sulphates and some iron.

Artesian Well in Mica Schist, near Radnor, Delaware County, Pa.

Notes by O. C. S. Carter.

Drilled on M. Wheadley's farm, in Chester county, Pa., in the *hydro-mica schist* of the South Valley Hill belt.

30' Sharp white quartz fragments.....to	30'
58 Schist, very micaceous, silver gray, soapy.	88

Water crevices struck at 70 and 85; water rose only 10 feet in the well, and stood at 70 feet below the surface; yield, only 120 gallons per hour; drops 5 feet after pumping five hours.

Feldspar Bed in Laurentian (?) Gneiss.

By Prof. Oscar C. S. Carter.

(Read before the American Philosophical Society, May 1, 1891.)

The feldspar quarry is opened on the east bank of the Schuylkill river, between Lafayette Station and Spring Mill, where the Reading Railroad (Norristown branch) and the Pennsylvania Railroad (Schuylkill Valley division) run side by side under the bluff outcrops of syenite and gneiss supposed to be of Laurentian or Archaic age, bordered on the south by C. E. Hall's Chestnut Hill Mica Schist belt of undetermined age.

A small stream cutting down into the Schuylkill just south of the quarry marks the contact of the mica schist and syenite and gneiss belts. About 100 yards north of the quarry is the granite vein described in Prof. H. D. Roger's *Geology of Pennsylvania*, 1858.

The county road runs between the railroad tracks and the bluff, and the feldspar bed is quarried for 35 feet alongside of the road. The feldspar